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A Description of the Cyprinid Fish Hybrid, *Notropis chrysocephalus x Notropis photogenis*, from the Greenbrier River, West Virginia

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INTRODUCTION

A survey of the fishes of Greenbrier River system (New River drainage, West Virginia) by Hocutt, Denoncourt and Stauffer (1978) yielded several specimens of the intrageneric hybrid *Notropis chrysocephalus x Notropis photogenis.* **Both parental species are widespread in the Ohio River basin, of which the Greenbrier is a part. Biologically,** *N. chrysocephalus* **is fairly well known (Carlander, 1969). It has been frequently ranked as a subspecies of** *Notropis cornutus,* **but it is presently regarded as a valid species (Gilbert, 1964; Bailey** *et al.,* **1970) although a controversy remains (Menzel, 1976). The life history of** *N. photogenis* **is poorly known. The only report of a hybrid combination involving** *N. photogenis* **is that of** *N. chrysocephalus x N. photogenis* **by Raney (1938: cited in Schwartz, 1972), but a description was not published. This paper describes the hybrid based on thirteen specimens from the Greenbrier system, and compares it to a morphologically similar hybrid,** *N. chrysocephalus x Notropis rubellus,* **also from Greenbrier River.**

METHODS AND MATERIALS

Collections of fishes were made in the Greenbrier River system in 1972 and 1974. Ten adult specimens of *N. chrysocephalus* **and ten** *N. photogenis* **from these collections were selected for comparison with the hybrids. Morphometric and meristic characters were determined following methods given in Hubbs and Lagler (1958). Measurements were made to the nearest 0.1 mm with dial calipers.**

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Values of anal rays and pelvic rays were summed to form an additional character, similar to the approach used by Raney (1955) for *Esox* hybrids. The averages for each character of the parental species were compared with the averages for the hybrids. A hybrid index was calculated following Hubbs, Hubbs and Johnson (1943):

$$H = (X_H - \mu_1/\mu_2 - \mu_1) \times 100$$

where H = hybrid index, x_H = hybrid value, μ_1 = value for *N. photogenis* and μ_2 = value for *N. chrysocephalus.* A hybrid index of fifty denotes exact intermediacy, while an index value greater than fifty suggests closer affinities with *N. chrysocephalus* and less than fifty indicates a closer relationship with *N. photogenis.* Only those characteristics which were significantly ($P < .05$) different between *N. photogenis* and *N. chrysocephalus,* as determined by Wilson's Rank Sum Test (Ott, 1977), were used in the calculation of the hybrid index. Because of the possibility of confusing *N. chrysocephalus x N. rubellus* hybrids with *N. chrysocephalus x N. photogenis* hybrids, two of the former hybrids from the Greenbrier system were also analyzed using the above techniques and compared with the latter.

RESULTS AND DISCUSSION

On August 30, 1974, eight *N. chrysocephalus x N. photogenis* hybrids were captured in Muddy Creek at the Route 3 bridge at Palestine, W. Va., and five additional hybrids were taken from Second Creek at the Monroe County road bridge, approximately 0.8 km upstream of U.S. Route 219. Specimens are deposited in the Appalachian Environmental Laboratory Fish Museum (AEL), University of Maryland, Frostburg, Maryland.

The overall appearance of these hybrids is clearly intermediate, although moderate variation is demonstrated (Fig. 1). The following characteristics are intermediate for all hybrids: snout length, body depth, head shape, scale size, scale shape, and position of the dorsal fin. Most individuals show a pattern, both in scale size and arrangement of melanophores suggesting longitudinal lines (Gilbert, 1964) on the body dorsum typical to *N. chrysocephalus.* However, in head shape, they more closely resemble *N. photogenis,* primarily because the snout appears longer on the head, which is not as deep as *N. chrysocephalus.* All hybrids have scales along the anterior lateral line which are intermediate in shape between the parental forms.

The sex of all specimens of the parental species was easily determined by "gross" examination of gonads. Hybrids had thin gonads, not conclusively identifiable to sex by "gross" examination. However, the hybrids were taken later than the known spawning period of N. *chrysocephalus,* and probably later than that of *N. photogenis.*

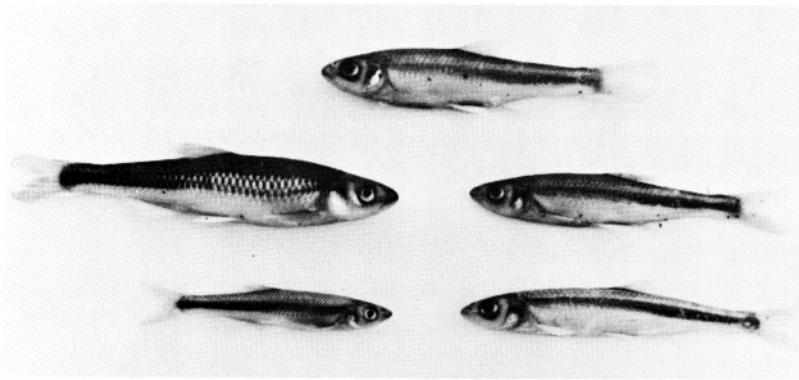

Fig. 1. Lateral view (top, moving, clockwise) of *Notropis chrysocephalus*, *N. chrysocephalus* × *Notropis photogenis* hybrid, *N. photogenis*, *Notropis rubellus*, and *N. chrysocephalus* × *N. rubellus* hybrid.

Table 1 summarizes data for thirteen morphometric and meristic characters. Eye diameter (expressed as thousands of standard length), snout length, and the distance between the snout and P2 were also measured, but values for the two parental types were not significantly different (P .05). Thus, these characteristics were not included in the analysis. The mean hybrid index was 48.1 based on mean values of morphometric and meristic characters and exclusive of three characters whose means were outside the range of the means of both parental species. Hybrid indices are intermediate (35-65) for seven characters, closer to *N. photogenis* in one character and closer to *N. chrysocephalus* in one. The mean hybrid index inclusive of the three characters in which the hybrids are outside the range of both parental species is 42.8.

N. chrysocephalus x N. photogenis can be confused with *N. chrysocephalus x N. rubellus* hybrids (Fig. 1). The latter combination is well known (Gilbert, 1961, 1964; Schwartz, 1972) and a detailed study of the very similar *N. cornutus x N. rubellus* hybrid was made by Miller (1963). Two specimens of *N. chrysocephalus x N. rubellus* were taken in the main-channel Greenbrier River, approximately 9.6 river km upstream from New River. The overall hybrid index of these two specimens was 44.1 (Table 1) when compared with the parents using eleven meristic and morphological characteristics. (The two characters which utilized pelvic rays were excluded, since eight rays occur in both *N. chrysocephalus* and *N. rubellus.)* Each of the thirteen *N. chrysocephalus x N. photogenis* hybrids was compared with the two *N. chrysocephalus* x *N. rubellus* hybrids. Characters which were most helpful in distinguishing the hybrid combinations were number of pelvic rays, head width, the distance from the snout tip to the dorsal fin (inserted more posteriorly in *N. rubellus),* and eye size.

Character	*photogenis* n = 10 Range	$\bar{x}$	Hybrid n = 13 Range	$\bar{x}$	Hybrid Index	*chrysocephalus* n = 10 Range	$\bar{x}$	Hybrid n = 2 Range	$\bar{x}$	Hybrid Index	*rubellus* n = 10 Range	$\bar{x}$
Standard Length (mm)	77-100.8	87.6	61.3-103.3	74.0	—	66.1- 85.5	75	85- 93	89.0	—	57- 64	60.8
Lateral Line Scale	39- 41	40.6	38 - 41	39.8	114*	39 - 41	39.9	40- 41	40.5	25.0	40- 42	40.7
Anal Rays	9- 10	9.9	9 - 10	9.8	11	9	9	10	10.0	90.9	10- 11	10.1
Pelvic Rays	9- 10	9.05	8 - 9	8.3	79	8 - 9	8.1	8	9	—	8	8
Anal Rays and Pelvic Rays	28- 29	28.1	25 - 27	26.3	62	25 - 26	25.2	26	26	—		
Thousands of Std. Length												
Head Length	226-259	241.5	236 -258	245.5	43	243 - 262	250.7	236-247	241.5	34.2	232-247	236.7
Head Depth	128-152	137.8	146 -160	152.6	56	153 - 175	164.1	141-156	148.5	38.8	133-145	138.6
Body Depth	165-219	184.1	191 -219	201.8	41	212 - 244	226.9	211-217	214.0	73.0	171-186	179.1
Head Width	110-124	116.2	109 -127	115.0	10*	121 - 135	128.5	108-112	110.0	4.1	104-113	109.2
Snout to Dorsal	497-542	516.1	488 -534	504.9	42	476 - 539	489.7	508-512	510.0	61.6	523-559	542.9
Thousands of Head Length												
Snout Length	316-354	339.8	304 -352	329.7	37	294 - 326	312.8	329-344	336.5	—	319-341	330.9
Head Length	529-602	570.0	579 -726	622.2	62	614 - 711	654.1	597-610	603.5	25.7	569-619	586.0
Thousands of Snout Length												
Eye	707-966	830	640 -958	808.7	23*	760 -1019	922.7	632-696	664.0	—	780-870	834.9

*Hybrid value lower than the mean for either parent.

Table 1. Comparison of the intrageneric hybrids, *Notropis chrysocephalus* × *Notropis photogenis* and *N. chrysocephalus* × *Notropis rubellus*, from the Greenbrier River with their respective parent species.

The individual variation among the *N. photogenis* hybrids prompted the calculation of a hybrid index for each. The mean of the individual indices was 52 with a range of 37-66. In order to evaluate this variation, an individual hybrid index was calculated for each of the parental forms. Indices for *N. photogenis* ranged from –27 to 27 and those for *N. chrysocephalus* from 67 to 140. Range of variation among the hybrids was smaller than among either of the parental species.

The reproductive habitat for *N. photogenis is* unknown. It is possible that the hybrids resulted from the two parental species spawning over *Nocomis* nests as reported for *Notropis cornutus* and *Notropis rubellus* (Raney, 1940; Miller, 1964). Several vacant *Nocomis* nests were observed at each site. Although *N. photogenis* have not been identified over *Nocomis* nests, they may utilize the downstream end. If such usage is infrequent, *N. photogenis* easily could be undetected among an aggregation of largely silvery spawning female cyprinids and *egg* predators normally present in that area of active nests.

In summary, thirteen *N. chrysocephalus x N. photogenis* hybrids were captured in Greenbrier River. The overall mean hybrid index was 48.1. The hybrids demonstrated individual variation, but could be distinguished from a morphologically similar hybrid combination, *N. chrysocephalus x N. rubellus.*

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